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WATER QUALITY MEMORANDUM

Utah Coal Regulatory Program

June 8, 2010

TO: Internal File

THRU: James D. Smith, Permit Supervisor

FROM: Steve Christensen, Environmental Scientist

RE: 2009 Fourth Quarter Water Monitoring, Genwal Resources, Inc., Crandall Canyon Mine, Permit & Tracking #3429

Water monitoring requirements for the Crandall Canyon Mine can be found in Sections 7.31.21, *Ground Water Monitoring Plan* and 7.31.22, *Surface Water Monitoring Plan.* Additional information can be found in Tables 7-4, 7-5, 7-8, 7-9 and 7-10.

Water encountered during mining operations was pumped to the portals and discharged to Crandall Creek under UPDES Permit No. UTU0024368. Discharges to Crandall Creek were within the limitations established by the permit with rare exceptions. Prior to 2008 the only sample containing iron at greater than 1 mg/L was on July 26, 2004, when iron was 1.08 mg/L.

Following the mine collapse in August 2007, the pumps were removed from the mine and discharge ceased temporarily. From September 2007 through December 2007 water pooled within the mine, flooding the underground workings. In January 2008 the mine began discharging by gravity flow and has been discharging continuously since. The temporary seals placed in the portals following the collapse-required modification for the mine water discharge. Iron concentrations in the mine water discharge occasionally exceeded 1 mg/L from January to November 2008; and have been greater than 1 mg/L continuously since December 2008. A water treatment system was constructed at the site in December 2009 to treat the mine water discharge

1. Was data submitted for all of the MRP required sites? YES ☒ NO ☐

Springs

The approved MRP requires the monitoring of 24 springs each quarter. Of these 24 springs, 9 require laboratory water quality analysis (See Table 7-4). The remaining 15 springs

require quarterly monitoring of field parameters (flow, pH, specific conductance and temperature).

The Permittee submitted all required samples for the spring monitoring sites.

Streams

The approved MRP requires the monitoring of 12 surface water/stream sites. Of these 12 surface water/stream sites, 9 require laboratory water quality analysis (See Table 7-8). The remaining 3 sites require quarterly monitoring of field parameters (flow, pH, specific conductance, temperature and dissolved oxygen).

The Permittee submitted all required samples for the stream sites.

Wells

The approved MRP outlines monitoring of 7 wells. According to Table 7-4, all 7 wells required quarterly laboratory water quality analysis. However, due to the mine disaster on August 6th, 2007, the active mine-workings have been temporarily sealed off thus rendering the wells inaccessible.

UPDES

The UPDES Permit/MRP (UT000024368) requires monthly monitoring of 2 outfalls: 001 and 002. Outfall 001 is associated with the discharge from the primary sediment pond at the main mine facility. Outfall 002 is associated with the mine-water discharge that reports directly to Crandall Creek.

The Permittee submitted all required samples per the terms of the UPDES discharge permit.

2. Were all required parameters reported for each site? YES ☒ NO ☐

3. Were any irregularities found in the data? YES ☒ NO ☐

Surface Water Monitoring Sites

The following surface water monitoring sites produced irregular concentrations/reported values for this quarter. Unless specifically noted, all other sites reported values that were within two standard deviations of the mean for the data set and followed established trends.

Site LOF-1- Increasing total-iron (T-Fe) concentrations in the mine-water discharge has

produced a similar rise in total-iron below the mine site at site LOF-1 (lower Crandall Canyon flume). An upward trend of T-Fe began during the 4th quarter of 2008. The reported T-Fe concentration for this quarter was 1.479 mg/L. The elevated iron levels below the mine-site in the Crandall Canyon drainage are expected to continue until such time as the Permittee completes the construction and successfully operates the water treatment facility currently under review. The daily maximum for T-Fe, as established by the UPDES permit for the mine, is 1.0 ppm. Once the water treatment facility comes on-line and reduces the iron levels in the mine-water discharge, it follows that a significant drop in T-Fe concentrations within the Crandall Creek drainage would be expected. Continuing monitoring will determine the effectiveness of the proposed water treatment system.

Section 4 Creek- A reported dissolved calcium (D-Ca) value of 80.21 ppm was reported for this quarter. This concentration is 2.39 standard deviations from the mean of 72.01 ppm.

Shingle Creek- Field conductivity was reported to be 1,028 umhos/cm. This value is 9.99 standard deviations from the mean of 679.43 umhos/cm.

UPF-1 (Upper Flume Crandall Creek) Three values were reported outside of two standard deviations:

- SO4- Reported value was 247.5 ppm which is 2.03 standard deviations outside of the mean of 86.89 ppm.
- Total Hardness (T-Hdns)- Reported value was 481.55 ppm which is 2.02 standard deviations outside of the mean of 312.60
- Total Dissolved Solids (TDS)- Reported value was 577 ppm which is 2.08 standard deviations outside the mean of 337.78 ppm.

Ground Water Monitoring Sites

The following ground water monitoring sites produced irregular concentrations/reported values for this quarter. Unless specifically noted, all other sites reported values that were within two standard deviations of the mean for the data set and followed established trends.

SP-22- Field conductivity was reported to be 652 umhos/cm, which is 3.23 standard deviations outside of the mean of 530.38 umhos/cm.

SP-36- Dissolved Calcium (D-Ca) was reported to be 70.92 ppm, which is 2.22 standard deviations outside of the mean of 63.64 ppm.

SP-58- Several parameters were reported outside of two standard deviations for this spring monitoring site. SO4 was reported outside of two standard deviations for the second consecutive quarter. The mean value for SO4 is 68.52 ppm. The reported value was 170.6 ppm.

TDS was reported outside of two standard deviations for the 3rd consecutive quarter with a reported value of 540 ppm. D-Ca and Total Hardness were also reported outside of two standard deviations of the mean.

SP-79- An elevated D-Ca concentration was reported with a mean value of 81.58 ppm and a reported value of 90.83 ppm.

SP 1-33- A SO4 concentration outside of two standard deviations was reported for the second consecutive quarter. The mean for SO4 is 22.88 ppm. A value of 39.8 ppm was reported for this parameter this quarter. Additionally, Dissolved Magnesium was reported outside of two standard deviations from the mean.

UPDES Sites (001 and 002)

Outfall 001 reported no observable flow for the quarter.

Outfall 002 reported elevated T-Fe concentrations. The UPDES permit established a T-Fe limit of 1.0 ppm. All three sampling events conducted at Outfall 002 this quarter were well outside the 1.0 ppm standard (8.03 ppm, 3.927 ppm and 3.102 ppm respectively for October, November and December).

The Division is currently in the process of working with the Permittee and reviewing a proposed mine-water treatment system. Until such time as the mine-water system comes on-line and begins to effectively treat the iron discharging from the mine works, continued T-Fe concentrations above the UPDES limit will continue to be discharged into Crandall Creek.

As noted the previous quarter, significant iron accumulations were observed within the channel of Crandall Creek. As part of the permitting process of the mine-water treatment system, the Permittee has committed to conduct a field inspection with all regulatory agencies once weather conditions allow access. The field inspection will be conducted in order to explore what (if anything) can be done to minimize the iron staining inside the channel.

4. On what date does the MRP require a five-year re-sampling of baseline water data.

Page 7-33 of the MRP states that groundwater samples collected during the low flow period (typically the 4th quarter) every 5 years will be analyzed for baseline parameters (See Tables 7-5). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

Page 7-35 of the MRP states that surface water samples collected during the low flow period every 5 years will be analyzed for baseline parameters (See Table 7-9). The 4th quarter of 2010 will be the next sampling event where baseline data will be required.

5. Based on your review, what further actions, if any, do you recommend?

Continued data collection and monitoring of the mine-water discharge will be necessary to evaluate the T-Fe levels within the mine-water discharge as well as the effectiveness of the mine-water treatment system once it becomes operational.

Continue to monitor water quality conditions downstream of the mine-site (specifically site LOF-1). T-Fe levels within the Crandall Creek drainage have been trending upward as a result of the mine-water discharge.

Monitor the D-Ca concentrations at surface water monitoring site Section 4 Creek.

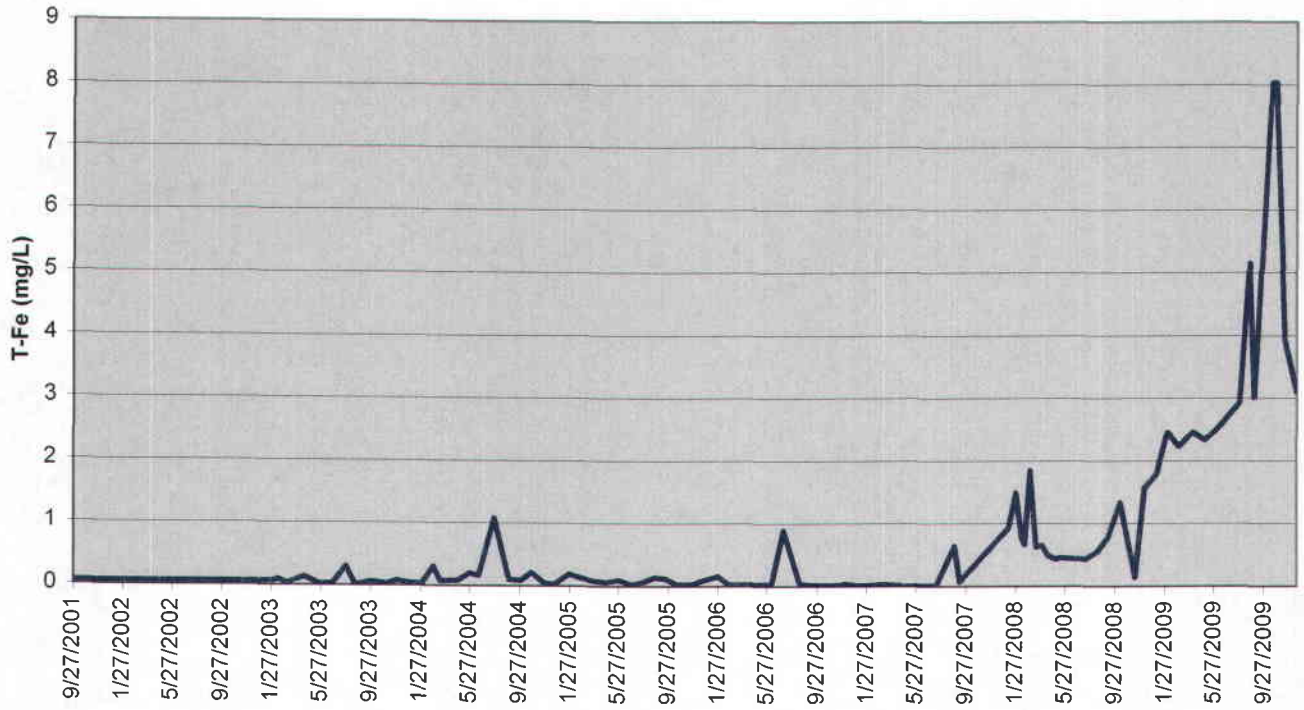
Continue to monitor conductivity values at the Shingle Creek surface water-monitoring site.

Continue to monitor SO4, T-Hdns and TDS values for surface water monitoring site UPF-1.

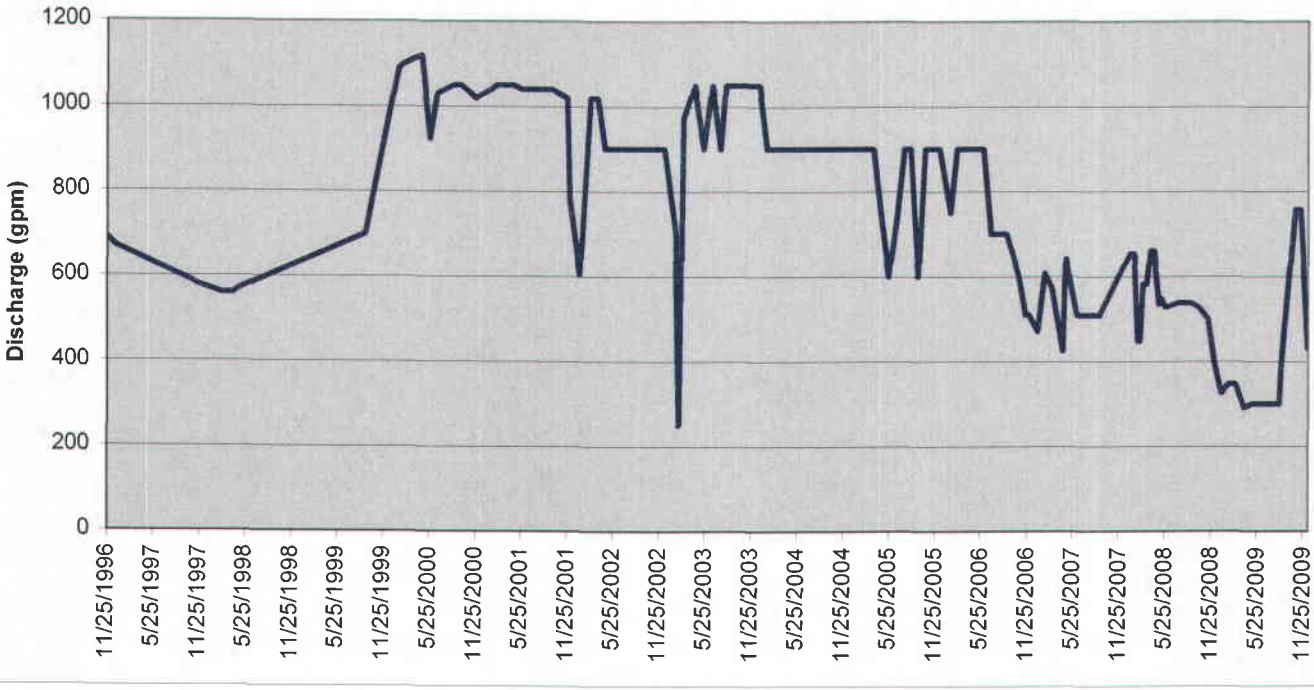
Spring SP-58 continues to show upward trends for TDS and SO4. Additionally, D-Ca and T-Hardns will be monitored in order to establish if an upward trend is emerging.

Work with other regulatory agencies in determining what if anything can be done to remove or mitigate the iron staining within the Crandall Creek stream channel (See Photos Below).

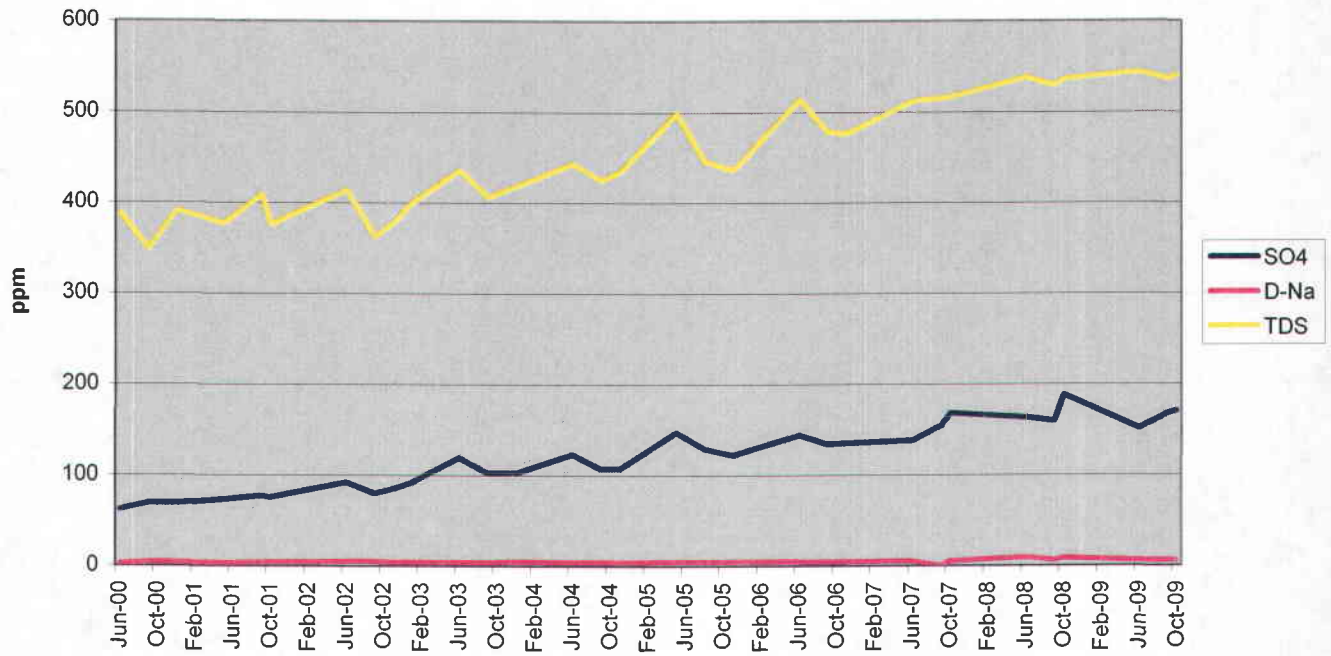
Total Iron (T-Fe): Outfall 002



Mine Water Discharge (Outfall 002)



Spring SP-58 Water Quality



Crandall Creek Lower Flume (LOF-1): Total Iron Levels